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MEMORANDUM

To:	Lower Willamette Group USEPA, Region 10	**Date:**	September 28, 2009
From:	C. Kirk Ziegler	**Project:**	010142-01
Cc:	Ricardo Petroni Daleel Nangju		
Re:	LWG HST Modeling Group Meeting on September 2, 2009		

The Lower Willamette River HST modeling group meeting and conference call was held on September 2, 2009 at the Anchor QEA office in Montvale, New Jersey. The purpose of the meeting was to review and discuss the development and calibration of the HST model and to obtain any comments from the Environmental Protection Agency (EPA) Region 10 representatives. Meeting participants in Montvale included Kirk Ziegler, Ricardo Petroni, Daleel Nangju, and Vicki List from Anchor QEA; and Earl Hayter and Charles Rodgers, representing U.S. Environmental Protection Agency (EPA) and other stakeholders. Kristine Koch and Rene Fuentes, representing EPA, participated via conference call.

Discussion on various topics related to the development and calibration of the HST model was guided by a presentation prepared and given by the Anchor QEA personnel. The discussion focused on these six primary topics:

- Analysis of DEA bathymetric data
- Modifications of hydrodynamic model
- Overview of SEDZLJ
- Sediment transport model development
- Review of model calibration results
- Model diagnostic results

Summaries of the discussion and resulting action items related to each of the topics are provided below.

Analysis of DEA Bathymetric Data

The group reviewed and discussed an analysis of the DEA bathymetry data collected between 2002 and 2009. An analysis of bed elevation changes for the 7-year period (January 2002 to January 2009) was discussed, as well as bed elevation changes for three sub-periods: 1) January 2002 to May 2003; 2) May 2003 to March 2004; and 3) and March 2004 to January 2009. The group reached consensus agreement that bed elevation changes during the January 2002 to May 2003 sub-period are anomalous, but the causes of this anomaly are uncertain. In addition, the group agreed that bed elevation changes during the May 2003 to January 2009 provide a representative data set for sediment transport model calibration. Additional analysis of the Lower Willamette River (LWR) hydrograph for the 5-year period prior to January 2002 will be conducted to determine if additional insights about potential causes of the anomalous bed elevation changes during the January 2002 to May 2003 sub-period can be developed.

Modifications of Hydrodynamic Model

A review of the hydrodynamic model focused on modifications to the original model developed by TetraTech and calibration of the modified model. Two primary modifications were made to the original model: 1) upstream inflow boundary condition in the Columbia River; and 2) spatial distribution of effective bed roughness. The model was re-calibrated after these modifications were incorporated into the hydrodynamic model.

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The group discussed the issue of no dynamic feedback between the hydrodynamic and sediment transport models. To evaluate the potential effects on the predictive capability of the HST model due to no dynamic feedback, a sensitivity simulation will be conducted using the 2009 bathymetry as model input. Currently, the model uses the 2002 bathymetry as model input. A comparison of predicted bed elevation changes for the model calibration period will be made between the original (2002 bathymetry input) and sensitivity (2009 bathymetry input) simulations.

During the discussion of hydrodynamic model calibration, three suggestions were made to improve the graphical presentation of model-data comparisons. First, add the results of the original model comparison (i.e., TetraTech results) to the model-data comparison plots for the modified model. Second, modify the plots to identify areas where in-channel structures are located. Third, laterally average the ADCP data so that the model-data comparisons are representative of cross-channel discretization in the model.

Overview of SEDZLJ

A general discussion of the structure of the sediment transport model, including formulations used in SEDZLJ, was conducted. The purpose of this discussion was to familiarize the group with the underlying model being applied to the LWR.

Sediment Transport Model Development

The group reviewed the primary inputs to the sediment transport model and how the site-specific data were incorporated into the model. The primary inputs discussed were: 1) sediment bed map; 2) bulk bed properties; 3) erosion rates of cohesive bed sediment; and 4) incoming sediment load. During the review of the sediment bed map, the dynamic nature of the bed type was discussed (i.e., can bed type change from cohesive to non-cohesive during a simulation). It is assumed in the model that bed type in a specific grid cell is constant with time. To evaluate the potential effects of this assumption on model predictive capability, a sensitivity simulation will be conducted with the bed type specified as cohesive for the entire modeling domain.

Discussion also focused on the analysis of erosion rate (i.e., Sedflume) data for incorporation into the sediment transport model. This discussion resulted in the following suggestions for additional evaluations so as to develop a better understanding of spatial variability of erosion properties of cohesive sediment in the LWR. First, evaluate possible correlation between the erodibility (i.e., erosion rate [ER] ratio) at core locations to predicted bed elevation change in the grid cells where the Sedflume cores are located. Second, provide the group with graphical results of correlations between ER ratio and bulk bed properties (i.e., bulk density, D_{90}, D_{50}).

Third, provide the group with graphical results of correlations between ER ratio and bed shear stress and water depth.

Review of Model Calibration Results

The group reviewed and discussed the model calibration results over a range of spatial scales. Based on a suggestion from the group, the model-data comparison presented on slide 94 will be modified so that three types of model performance will be indicated on the map: 1) agree; 2) disagree; and 3) uncertain. The uncertain category will reflect those grid cells where measurement error and other uncertainties make it difficult to determine whether or not model-data agreement (or disagreement) exists. It was also suggested that potential correlations between predicted bed elevation change and chemical bed concentrations be examined.

The current calibration strategy involves adjusting four parameters: effective diameters of class 1, 2, and 3 sediment and active layer thickness in the non-cohesive areas. It was recommended that the number of calibration parameters be reduced from four to three because this modification will significantly increase the credibility of the model and its acceptance to external reviewers. The first step in the re-calibration process will be to evaluate the sensitivity of model predictions to each of the four original calibration parameters. Based on our understanding of the behavior of the current model, the group speculated that the most likely candidate for elimination as a calibration parameter is class 3 effective diameter. After the sensitivity analysis is completed, the model will be re-calibrated using three adjustable parameters.

The group discussed the approach for model validation, which will focus on model-data comparisons of bed elevation change for two sub-periods: 1) May 2003 to March 2004; and 2) March 2004 to January 2009.

Model Diagnostic Results

Model diagnostic results at 15 grid cell locations were reviewed and discussed. It was generally agreed by the group that the diagnostic results were very useful for understanding model

performance and reliability. The group recommended that similar diagnostic plots be developed for the 15 grid cells where the Sedflume cores are located.

Next Steps

The next steps will be for EPA to review this meeting memorandum and verify that the action items and agreements are properly captured. EPA will issue a letter to the LWG stating any requested revisions to the action items and agreements, as well as authorization to proceed with using the HST model for FS modeling purposes. Assuming any changes to the action items and agreements are agreeable, the LWG will proceed with refining and then using the model for the FS. There are no other HST model-specific check-ins planned and EPA will next review HST modeling results in the draft FS.